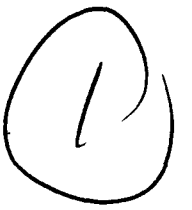

ACCIDENT PREVENTION THROUGH EFFECTIVE SAFETY MANAGEMENT

BY

ROBERT G. FAHEY

A REPORT PRESENTED TO THE GRADUATE COMMITTEE
OF THE DEPARTMENT OF CIVIL ENGINEERING IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF ENGINEERING

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CHAPTER I
INTRODUCTION

1.1 Background

Job-site accidents take a serious toll on the $300 billion-a-year United States construction industry. Work-related injuries and illnesses in construction occur at a rate that is 54% higher than the rate for all industries, making it one of the most dangerous occupations (2-3). In addition to the pain and suffering incurred by effected workers, accidents cost the end users of commercial, industrial and utility construction $20 billion annually. Owners are becoming increasingly aware that employing unsafe contractors means higher costs. To remain competitive, the savvy contractor must continually seek ways to improve safety performance.

1.2 Overview of Report

The key to a safe, hazard-free construction site goes beyond the ability to recognize and correct safety violations. Companies with outstanding safety records employ managers skilled in management techniques that have proven to produce safe construction. They realize that concern for safety begins with the chief executive and runs down the chain-of-command to the foreman and his crew. These companies have strong, structured safety programs that emphasize training and planning, resulting in safe day-to-day operations. The purpose of this paper is to

show how proper management techniques and a strong safety program result in low accident rates.

Chapter two demonstrates how safe contractors save money with a small investment in a strong safety program. The large impact of Worker's Compensation insurance, combined with the often ignored indirect costs of accidents, reveal the substantial savings available to the contractor willing to put forth the effort to improve safety performance.

Most construction managers can easily spot unsafe conditions, but they are rarely trained in the art of spotting the conditions that lead to unsafe acts. Chapter three dispels some common myths about the causes of accidents and provides some basic information on conditions that make unsafe acts more probable.

The heart of the report lies in chapters four and five. Armed with the information provided in chapter three, the reader can more easily understand why effective management is the key to excellent safety performance. Chapter four, Management's Role, reviews the action steps taken by the chief executives, job-site managers, and foremen with the best safety records. A 1967 National Safety Council Survey quizzed 148 safety experts and found that supervisory and top management participation was the crucial link directly effecting worker safety behavior (13-90). Top management must provide the initial push; the supervisors must maintain the program momentum daily; and middle management participation is necessary to create the chain-of-communication

and command. Effectively communicating goals, proper accountability, correct priorities, and skillfully handling workers are all key ingredients necessary at all levels of the chain-of-command.

Chapter five analyzes the requirements for a comprehensive safety program. Adequate training, proper planning and a check and balance system result in safety performance that will continue to improve over time.

Chapter six provides a brief summation of conclusions and recommendations. Incorporating some or all of the concepts discussed in this report can help any size contractor reduce accident frequency.

CHAPTER II
CONSTRUCTION SAFETY PAYS

2.1 Accidents are Expensive

Construction is a dangerous business. Three thousand construction workers die each year as the result of accidents. Construction has more injuries per 100 workers than any major industry (4-1). Accidents costs the United States construction industry over twenty billion dollars every year. The cost in pain, suffering and dollars is overwhelming. So why hasn't the construction industry responded with an all-out effort to improve safety and reduce accidents?

The main reason is that many contractors believe accidents are an inherent part of construction that cannot be avoided and extra safety measures are nothing but an added cost. After all, safety equipment, toolbox meetings and safer procedures cost time and money. Occupational Safety and Health Administration (OSHA) regulations are viewed as a hindrance and contractors do only the minimum required in the belief that anything extra is a waste of money. Nothing could be further from the truth. The facts show that a relatively small investment in a solid safety program pays out huge dividends. This section analyzes the cost of construction accidents and the cost of an effective safety program to demonstrate how construction safety pays.

2.2 Worker's Compensation

Worker's Compensation laws require the employer to compensate its employees for injuries suffered in the course of work. Benefits available to employees include medical and hospital care, compensation for a disability, cash benefits for lost income, costs of rehabilitation and death benefits. Most contractors pay premiums to insurance companies to cover the cost of Worker's Compensation claims. Contractors' Worker's Compensation premiums range between 1% and 12% of a typical contract price (11-89). This wide range is due to the fact that premiums are based on the type of work involved and the contractor's previous safety record. A closer look shows that reducing Worker's Compensation premiums is the largest single cost savings a contractor can obtain through an improved safety record.

The type of work in which the contractor is involved is reflected in the manual rate of Worker's Compensation insurance premiums. The manual rates are determined each year for about 450 work classifications (e.g., plumbers, carpenters) based on medical costs and benefits paid in each work classification plus administrative costs. Rates are expressed in dollars per $100 of payroll. Therefore, manual rates show the comparative accident costs of different trades in the construction industry. For example, the manual rates for pipefitters and ironworkers were

5.57 and 16.17 respectively in 1983 (11-7). A contractor employing only ironworkers with a payroll of $100,000 during the year would thus be quoted a base premium of $16,170.

An experience modification rating (EMR) is applied to the contractor's manual rate to obtain the total premium. The EMR is expressed as a percentage and is intended to award a discount to those contractors with lower than average claims and inflict a surcharge on those with higher than average claims. For example, a contractor with an EMR of 70% would pay a Worker's Compensation premium which is 70% of the manual rate as a reward for his better than average claim experience. The only employers not eligible for an EMR are those with very few employees. For example, in California any contractor with less than $13,100 in premiums would not be eligible for an EMR.

Surveys show that contractor's EMRs range very widely (11-9). In a sample of national industrial contractors, EMRs ranged from 35% to 260%. The effect of a company's EMR on its premium is shown in Table 2-1.

Table 2-1, EMR Impact on Cost of Worker's Compensation Insurance for Typical $100 Million Construction Project

EMR	Cost of WC Insurance
35	$831,033
50	$1,187,190
60	$1,424,628
100	$2,374,380
140	$3,324,132
260	$6,173,388

Source: (11-9)

It is obvious that a low EMR gives a company a significant advantage over its less safety conscious competitors. This is especially true in work that is labor intensive, hazardous and competitively bid. For example, a contractor that specialized in highway bridges reported that if his experience modification rate ever went above 100% he would be unable to obtain work (12-63). Also, many large contractors doing mostly negotiated work noted that most sophisticated clients are very concerned about "how much insurance they are buying" when choosing contractors for their projects (12-64). The state of California wisely refused to award a contract to a company that had incurred ten deaths and 171 injuries in the previous three years (7-9).

Sophisticated owners also desire safe contractors because they realize they may be sued as a result of the contractor's negligence. There are many cases where workers have successfully sued building owners. For example, a contract worker on a state contract was injured during the excavation portion of the job and was awarded $132,000 when he sued the state. This normally would be a Worker's Compensation case with benefits paid by the employer's insurance company. However, the court ruled that state officials had approved the contractor's work plan and the state was therefore responsible (4-58). Hold harmless clauses offer no escape. "Buyers have been found liable for construction injury claims even when they wrote 'hold harmless' provisions into their construction contracts and scrupulously avoided any

direction or guidance to contractors in matters dealing with safety" (11-174).

2.3 Indirect Costs of Accidents

Contractors can easily track the direct costs of accidents by reviewing records obtained from their insurance companies. Records of indirect costs of accidents are rarely kept primarily because they are difficult to quantify. Safety experts like to show the relationship between direct and indirect costs using the familiar pyramid or iceberg examples where direct costs represent the tip and much larger indirect costs loom below. But exactly how do direct and indirect costs compare? The following is a list of indirect costs that may be incurred as the result of an injury (11-18):

(a) Transportation required to move the injured worker to a medical facility.

(b) Wages paid to an injured worker for time not worked.

(c) Costs due to delays resulting from the accident. This includes overtime required to stay on schedule.

(d) Loss of crew efficiency resulting from lower morale. Crew efficiency can drop dramatically, especially after a serious accident.

(e) Costs to break in and/or teach a replacement worker. Costs resulting from a less efficient replacement are included in this category.

(f) Costs for clean-up, repair and replacement. Property damage often accompanies accidents.

(g) Costs of wages for white collar personnel as a result of the accident. This includes time spent to investigate the accident, planning to prevent recurrence, and completion of paperwork.

(h) OSHA and civil fines.

(i) Cost of legal assistance.

The costs listed above are highly variable, depending greatly on the type and severity of the accident involved. Dr. Raymond Levitt of Stanford University conducted a study of twenty-nine construction companies to determine the ratio of indirect costs to benefits paid. His results are shown in Table 2-2.

Table 2-2, Analysis of Direct and Hidden Accident Costs

Range of Benefits Paid ($)	Number of Cases	Avg. Benefits Paid (Direct Costs) ($)	Avg. Hidden Costs ($)	Avg. Ratio of Hidden Cost to Benefits Paid
Nonlost Time				
0 to 199	13	125	530	4.2
200 to 399	7	250	1,275	5.1
400+	4	940	4,740	5.0
Lost Time				
0 to 2,999	9	869	3,600	4.1
3,000 to 4,999	8	3,947	6,100	1.6
5,000 to 9,999	4	6,602	7,900	1.2
10,000+	4	17,137	19,640	1.1

Source: (11-21)

The average ratio of indirect costs to benefits paid from the samples used in Table 2-2 is 4 to 1. Therefore, the unseen part of the accident cost iceberg is four times larger than the tip. This is probably a conservative estimate since it does not measure intangibles such as damage to a company's reputation or effect on employee morale.

2.4 Savings from an Effective Safety Program

Many construction companies have structured safety programs. Cost items included in these programs include orientation sessions; safety meetings; site inspections; personal protective equipment; health programs; tool and equipment inspections; and salaries for safety, medical and clerical personnel. A study by the Business Roundtable indicated that the average safety program costs 2.5 percent of direct labor costs (11-23). Many elements of the typical safety program are mandated by law. Levitt concluded that the added cost of a safety program beyond what is legally required is approximately 1 percent of direct labor payroll, and that 1 percent is usually in the form of salaries for safety professionals.

How much money will a safety professional save? A conservative estimate is that claims costs will be reduced by at least 25 percent. Accident claims costs are estimated to be 5.2 percent of direct labor costs. If indirect costs are four times direct costs, then accidents cost the average contractor 26 percent of direct labor costs (5.2 + 5.2(4) = 26). A 25

percent savings amounts to 6.5 percent of direct labor costs. Subtract the 1 percent cost of the safety professional and a savings of 5.5 percent of direct labor costs is realized.

Since direct labor averages about 25 percent of job costs, the 5.5 percent direct labor savings translates to a 1.4 percent savings on total job costs. This is a conservative figure and some companies have done substantially better. Exxon Corporation exercises strict control over its contractors and subcontractors. Lost-time accidents and compensation payments on a 24 million man-hour project it recently completed were only 10 percent of the industry average and there were no fatalities (4-14).

CHAPTER III
CAUSES OF ACCIDENTS

3.1 Unsafe Conditions or Unsafe Acts?

Accidents are often grouped into two categories: those resulting from technological, mechanical or physical causes such as unsafe conditions and those resulting from unsafe acts. Examples of the first group include defective or damaged equipment. Examples of unsafe acts include ignorance of risk and negligence.

Unsafe conditions are often considered to comprise 15% of all accidents with 85% attributed to unsafe acts. A study by Heinrich in 1928, which covered 75,000 accidents, concluded that 88% of all accidents were caused by unsafe acts, 10% were caused by unsafe conditions and 2% resulted from conditions which could not have been prevented (10-34). Heinrich's study contained numerous flaws which affected his results. Most notably, when Heinrich concluded that an accident resulted from both unsafe acts and unsafe conditions, he selected what he believed to be the major cause. Therefore, many consider his results invalid, and the ratio between unsafe conditions and unsafe acts is more likely closer to 1:1.

Care must be taken to properly classify the accident during the investigation. For example, a worker may fall after climbing a ladder because he lost his balance while stretching to do his work. At first glance, this is an unsafe act. However, closer analysis indicates that with a longer ladder the worker would not

have needed to stretch to accomplish his work. Therefore, it is an unsafe condition.

The bottom line is that most accidents are caused by a group of circumstances. Unsafe conditions and unsafe acts are found at almost every accident scene. Effectively preventing another accident requires the investigator to recognize all causes. Remember that no useful purpose will be served if circumstances which cannot be prevented are cited as the sole cause of the accident. Factors such as carelessness, negligence, and absent-mindedness may be considered as contributing factors, but not as main accident causes.

3.2 The Workplace Environment

The most important psychological element in promoting safety is the quality of the workers' environment. Many studies have concluded that accident frequency is greatly influenced by the general atmosphere. When workers are unhappy with wages, working hours and labor conditions accident frequency increases. The opposite is true when job conditions are good.

The manner in which a worker behaves is often a reflection of his material and psychological environment. Reasonable wages, good relations between management and labor, correct decisions on promotion and an organized, sanitary workplace all influence a worker's behavior and have proven to be conductive to greater safety. These factors also contribute to lower worker turnover which in itself promotes safety because experienced workers are

less likely to experience accidents. Chapter four discusses in depth the actions management can take to maximize the quality of the workplace environment.

3.3 Accident Proneness

Many people believe that a majority of accidents occur to the accident prone. This theory is based on observations of groups of workers where some had no accidents and others had several in a given period of time. Although this theory was popular in the past, the facts show that it is in error and that some workers are merely victims of the law of probability. When statistics are collated over a period of time for a population, some individuals have significantly more accidents than others. "Even if everyone is equally likely (or unlikely) to have an accident, pure random chance leads us to expect some people with many accidents" (14-49).

" A careful review of the accident statistics for construction companies indicates that there is a very large range in accident experience among firms with similar exposure situations and employees drawn from the same labor pools. Some companies have far better safety records than others. This same kind of comparison has been made at the project manager and at the foreman level" (14-48). This wide variety in accident rates between companies, project managers and foreman point toward other factors heavily influencing accidents rather than accident proneness. If accident proneness were a major factor, safety

records of these various groups would tend to be the same. The wide range in safety performance points to the fact that management and supervision is the key factor in accident reduction.

3.4 Causes of Unsafe Acts

All levels of management, as well as most workers, receive training in how to recognize unsafe conditions. Almost anyone on a construction site can easily point out a fall hazard or notice that a back-up alarm for a loader is missing. However, few personnel receive training on the causes of unsafe acts, the other major contributor to accidents. Although causes for unsafe acts often overlap, they can basically be broken down into lack of knowledge or inadequate skill, motivational factors and problems of inattention (5-32). A complete safety management program is not complete without key personnel having a working knowledge of these factors.

3.4.1 Lack of Knowledge

It may seem obvious that workers need to understand their job and its inherent hazards, yet many supervisors seem to take this for granted. New workers are far more likely to have an accident than their more experienced counterparts. Appendix A illustrates how only a few months of experience greatly reduces accident probability. The effective supervisor will carefully break-in the new worker and ensure he understands the work and

its associated hazards before demanding that the worker perform at the level of his more experienced counterparts.

3.4.2 Motivational Factors

There are certain motivational factors present on the job-site that can cause the worker to perform an unsafe act. Most construction workers are proud of their physical strength, a beneficial trait in many trades. Many workers also mistakenly believe that physical strength is also a measure of their manhood and like to display this manhood by lifting heavy objects normally requiring the effort of two people. It is no wonder that back problems occur so frequently in construction.

Many construction workers believe that taking risks is a part of their jobs. In order to be considered competent they feel they must be able to complete a job quicker than the other guy, thus the need to cut corners and take shortcuts. As has been shown, safe work is cost effective work. This philosophy must be effectively communicated to the lower ranks.

The desire to keep a job, especially in tough economic times, is a strong motivational factor. This is especially true in the case of a new worker who is most likely to be the first person laid off. Some employees may push themselves too hard, risking injury or impairment of health in order to retain their jobs. To prove themselves, new employees may impatiently ignore the measures and precautions intended to protect them. Again, new workers require special attention.

3.4.3 Problems of Inattention

As has been shown, the workplace environment is the critical factor in the well being of a worker. A worker who worries about job conditions while on the job presents a hazard. There are also problems outside of the workplace that the supervisor must be on the lookout for.

"Inattentive behavior is especially likely to occur among young employees in the first several years of their work life and among employees entering middle age (the 40's and early 50's). These are the dangerous ages, when susceptibility to accidents tends to be high" (5-41). This inattention is caused by high stress. Young employees are breaking family ties and are adjusting to a new way of life. Perhaps they have never been on their own before. Middle-aged employees experience a higher percentage of family, personal, and health problems. Appendix B shows the results of research that tabulated "life change units" for different events in life. With the table in Appendix B, " it was found that of those persons who reported life change units (LCUs) totaling between 150 and 199, 37 percent had illnesses within two years. Of those between 200 and 299 units, 51 percent reported illness, and with over 300 LCUs, 79 percent had injuries and illness to report" (8-42).

Every employee will experience high stress periods during his career. The smart supervisor learns to spot the employee who seems troubled. While the supervisor cannot solve all of his people's problems, he may be able to refer them to someone who

can help. The supervisor must avoid being a shoulder to cry on. Job problems must be kept separate from personal problems. Discussing and attempting to solve personal problems on the job distracts from the work at hand and adversely impacts job-site safety.

CHAPTER IV
MANAGEMENT'S ROLE

4.1 The Chief Executive

Whether the top rung of the ladder is the Commanding Officer of a Seabee Battalion or the president of a construction company, one axiom holds true: safety begins at the top. Organizations that feature a chief executive who places a strong emphasis on safety and effectively communicates this concern to his subordinates have better safety records than the companies where this is not the case. In cases where the chief executive learns about the benefits of good safety performance and exhibits increased concern for safety, his organization's performance often improves dramatically.

A chief executive is defined as a manager who has overall responsibility for the performance of a company or for an autonomous operating division of a major company or public sector agency. He is accountable for the performance of his organization and has the authority to establish policies and procedures.

Since chief executives are rarely present on the job-site, they must use the chain-of-command to effectively execute their policies. Research has shown that chief executives in the safest organizations exert a strong positive influence on their organization's safety performance in three basic ways (11-42):

1. They communicate the message that safety is of the utmost importance to the company in their dealings with employees at all levels and with outside groups. They accomplish this in oral and written communications such that they do not undermine the authority and responsibility of their line managers.
2. They place the primary responsibility for safety on line managers and hold them accountable for the safety of their subordinates.
3. They demand that accounting, safety, and other staff support groups provide the required expertise and resources to the responsible line managers and to senior management.

We will now take a closer look and lay out some specific action steps that chief executives can take in each of these three categories in order to establish a favorable atmosphere for safe construction.

4.1.1 Communicating Safety Goals to Employees

A chief executive may have lofty safety goals, but unless he can effectively communicate his desires down the chain-of-command his plans are doomed to fail. Direct evidence of concern for safety includes committing substantial resources to training, monitoring, and other safety related activities. A manager can also exercise his leadership skills in the safety arena in more indirect, but equally effective means. Following are some

examples of how chief executives in the safest companies communicate safety goals to employees and outsiders.

4.1.1.1 Promoting the Right People

Most workers expect management to promote the most competent employees. Workers become disgruntled when it becomes obvious that promotion is based on "who you know, not what you know". The type of people management promotes is a strong indicator of where an organization places its priorities. As we have seen, safety pays extremely well and those who produce should be rewarded. The attitudes and behavior of recently promoted personnel are likely to be copied by others who are ambitious. "This `copycat' effect of promotions on the behavior of others may be even more important than the direct motivational effect" (11-48). Chief executives in the safest companies ensure that newly hired or promoted managers have a high regard for safety.

4.1.1.2 Job-Site Visits

Most construction workers are impressed with a chief executive who likes to get his hands dirty and visit the job-site. In addition to providing the opportunity to check on progress and quality, the job visit offers the chief executive the opportunity to talk to the workers and stress what he

considers important. Since the workers so rarely have an opportunity to interact with the chief executive, it is important that he chooses his words well.

This is a chance for the chief executive to show what he knows about the project's good safety record and that he wants this record to continue. Praising the project's good record or commenting about the project's safety environment serve to send the message that top management is concerned about safety. This process of the chief executive communicating the organization's goals to employees through direct comments made on job-site visits is referred to as "managing by walking around" by Tom Peters in his book "In Search of Excellence" (11-48).

It is critical that the chief executive have a good working knowledge of safety regulations. Without this, he would be unable to judge whether a job-site is safe or not. Any discrepancies that he wishes to bring to the project manager's or foreman's attention should be done as to not undermine their authority. As with most other situations of this type, the "praise in public, punish in private" axiom would apply.

4.1.1.3 Safety Functions

Many companies hold safety committee meetings on a recurring basis. Their purpose is to improve safety performance through a group approach to solving safety problems. It is important that the chief executive take an active role to further exhibit his concern for safety. For example, Naval Construction

Battalions feature numerous committees that meet on a monthly basis, most chaired by the Executive Officer. However, the Commanding Officer chairs the Safety Committee.

Other functions where safety is involved, such as award ceremonies, should also garnish much attention from the chief executive. People respect those who "put their money where their mouth is."

4.1.1.4 Using Written Communications

Many organizations publish statements from the current chief executive regarding various issues such as policies on discrimination, sexual harassment, etc.. Publishing a policy statement on safety helps communicate the level of attention the organization places on this issue. This statement should be displayed prominently, especially at job-sites. An excellent method to get a new employee off on the right foot would be to issue him an introductory letter covering company policies with a strong emphasis on safety policies.

Personal letters can continue to be effective during an employee's career. For example, when the president of a construction company noticed his that safety performance had slipped over the last year, he sent letters to each foreman asking them to work with him to return to their previous level of success (11-50). Nearly every foreman responded to his letter.

4.1.1.5 Communicating Safety Concerns Outward

Chief executives in the safest firms make it a point to communicate safety issues to other organizations. Participating in industry safety workshops and committees sends a message to peers in the industry and potential construction buyers that the firm is concerned about safety. Showing subcontractors that unsafe acts or conditions are unacceptable sends the message that those who cut corners on safety will not be hired by this firm. Involving OSHA and other regulatory agencies, as well as the firm's insurance company in preconstruction consultations further enhances the company's reputation. Favorable publicity can also be obtained through articles in the company newsletter or industry publications.

4.1.2 Establishing Accountability for Safety

Chief executives set the goals and performance standards by which managers are to be judged and then must evaluate the degree of success attained. Therefore, chief executives must set achievable safety objectives and assure they are monitored at all levels of the organization. The chief executive does not directly supervise work, so he cannot be responsible for the safe acts of every worker. However, as the senior man, he is accountable for their actions and the results they obtain. "A strong safety accountability system exists when (11-51):

1. Each manager has a safety goal to meet that he believes is attainable.

2. Feedback on progress toward achieving that safety goal is furnished on a regular basis to the manager and his supervisor.
3. There are meaningful rewards for the manager that are associated with meeting the safety goal.

4.1.2.1 Measuring Safety Performance

Most construction companies would be hard pressed to review their records and determine the total of direct and indirect costs of any given accident. The reason is that the accounting system typically used by construction firms for keeping track of project costs bury accident costs (11-3). Direct costs of accidents are often combined with other insurance costs as part of the overall figure for labor burden. Indirect costs are concealed in extra labor, material and equipment costs which result from accidents but can never be traced back to accidents.

The Stanford Accident Cost Accounting System was developed by Michal Robinson to be used as a management system to increase accountability for safety performance by immediately measuring and highlighting accident costs (11-27). Robinson's objective was to develop a method "which would provide the construction manager with a schedule of costs which are a function of some easily and quickly determined variables arising from the accident" (11-28). The resulting Accident Cost Schedule is shown in Appendix C. When using the schedule, multiple person

accidents are treated as a series of single person accidents with costs added together. In cases where a single person suffers multiple injuries, the highest cost is used.

The Cost Accounting System has proven its effectiveness. Results show that the schedule accurately reflects insurance claims but needs more cushion to reflect hidden costs. This is primarily due to the fact that the System was developed before much of the research on indirect cost was completed. Many companies have integrated their own data resulting in a modified Schedule that more accurately reflects their costs. The System has proven to be a valuable management tool. Its main use is to establish accountability for safety at all levels of management, increase awareness of accident costs and identify trends to help management pinpoint problems and develop solutions.

Many construction companies use lost-time accidents as the sole measure of their safety performance. This is an easily understood statistic that can be used for comparing project or company performance, but it frequently hides reality. Lost-time accidents are rare. On one dam project that lasted 11 months there was only one lost-time accident . However, in the same period there were 142 accident cases requiring medical aid, 669 first aid cases and one death (11-153). Although the casual observer may be impressed with the company's lost-time record, its insurance would know better. The formula used to calculate a company's EMR counts accident frequency much more heavily than

severity. The logic here is that accident frequency is more controllable than accident severity.

Based on the above, the most effective measure of safety performance is accident costs per man-hour. The Cost Accounting System can be used to assign costs. This statistic allows for easy comparison between different jobs or managers.

4.1.2.2 Objectives for Senior Line Managers

Now that the organization's safety standards have been established, the chief executive can meet with his managers to set goals for safety performance. Managers must understand they are expected to carry out all work safely and that they will be evaluated on their performance. To effectively communicate this message, the chief executive should be thoroughly familiar with how safety performance effects the viability and profitability of the organization. He must then convert this concept into specific goals that each manager will be expected to meet.

The safest companies are led by chief executives who are direct in setting safety objectives for their subordinates. Subordinates who do not accept safety as an important and controllable performance objective should be relieved of management responsibility. Safe companies feature project managers, superintendents and foreman who are as proud of their safety record as they are of their record of quality and timeliness. Care must be taken to establish ambitious but realistic safety goals. Unrealistically high standards may cause

the manager to disregard the goal because he knows it can never be attained. His faith in the company's leadership will also be diminished.

4.1.2.3 Reporting on Safety Performance

Goals are useless unless a reporting system is in place to keep management informed of performance. The chief executive is responsible to ensure that each manager is provided with a periodic summary of his unit's safety performance. The Accident Cost Accounting System previously discussed can be used along with time cards and accident reports to give accident costs per man-hour supervised. This information could be tabulated using a spreadsheet or database and would require little effort to update. It is recommended that a formal procedure be implemented to disseminate this information. This will ensure that even when things get busy, safety and the costs of accidents still get the required attention.

4.2 The Job-Site Manager

The job-site manager carries many different titles depending on the size and complexity of the organization. Whether his title is superintendent, field superintendent, or operations chief, one factor remains consistent: the job management skills of the job-site manager have a significant effect on safety performance. Research reveals that "job-site managers with excellent safety records have different management values. goals,

and methods than do managers with poorer safety records" (11-74). This section details their priority systems, planning methods, communication systems and other factors which contribute to this success.

4.2.1 Setting Priorities on the Job

Quality in construction is attracting substantial attention these days. We have already seen that construction safety pays as well. The secret to successful project management is treating safety and productivity as two related parts of high job performance. A former Naval Construction Battalion Commanding Officer often referred to Seabee work as "safe, quality, timely construction training", with an emphasis on that priority. Contrary to what many in the old school believe, focusing on safety and quality will naturally lead to timeliness.

4.2.1.1 Highlighting Safety

Because of the traditional emphasis on productivity, the job-site manager's best tool for improved safety performance is effectively communicating his desire that safety be considered the number one priority. One senior project manager tells his staff that " If it can't be done safely, it is not going to be done at all on this job. Safety is most important" (11-66). Construction workers are no different than white collar personnel. They want to know the boss's priorities and what is expected of them.

Highly successful job-site managers make communicating the priority of safety to the entire work force their initial task on a new project (11-76). Construction is a very decentralized industry characterized by job-sites with dynamic, changing environments. As a project progresses, the safety hazards present change as frequently as the personnel. A simple safety brief before a job starts is only the beginning. Each phase of construction and the arrival of every new subcontractor requires special attention. The job-site manager must communicate his concerns to all those working on the site, from subcontractors to material suppliers.

Establishing safety as "Job One" does not have to wait until ground is broken. Safety concerns should be reflected in the bid and budgeting of the project. Questions such as required safety staff, safety equipment, and construction methods must be addressed in the early stages. A further discussion of successful safety planning is included in chapter five.

4.2.1.3 Importance of Personal Commitment

Just as in the case of the chief executive, a willingness to take an active, personal role in ensuring safe construction by the job-site manager significantly improves safety performance. This positive attitude towards safety is picked up by staff and subordinates and their performance improves. " In a study of crew safety (Samelson, 1983), crews who

describe their supervisors as personally committed to safety had fewer accidents" (11-79).

Increasing safety visibility on the job-site is one way of demonstrating personal commitment. For example, the level of housekeeping is a good way to immediately gauge the level of safety on a project. One extremely successful manager who has a reputation for turning around projects gone bad always starts by improving housekeeping from his first day on the project (8-79). A clean work environment, free of trash and with all materials stacked neatly, gives the immediate impression that this is a safe job-site. It tells the workers that the manager has a genuine commitment to safety.

OSHA regulations are almost universally criticized by those in the construction industry. While OSHA definitely has its problems, following its regulations is an important part of any safety program. The desire to enforce OSHA requirements is another way to demonstrate safety commitment to workers. " When Hinze (1976) asked managers to suppose that an OSHA inspector came on the job and then to decide if there were any logical items that they might be cited on, he found that the managers who answered no to that question had significantly better safety records than those answering yes" (11-79). Those answering yes often added comments such as "they always can" and "they could find something to cite on any job". This negative attitude supports the false belief that no matter what is done, a job-site cannot be made safe. A positive attitude must be displayed

towards all safety policies and procedures. Workers are quick to pick up on the negative attitudes of their leaders.

Commitment to safety can be shown in a variety of other ways. Attendance and participation in weekly safety meetings is a definite must. Support for the actions of safety representatives and other safety professionals is also critical. These personnel speak for project management and supporting their actions supports the chain-of-command. If the manager disagrees with the views of a safety representative he should work to resolve the conflict and come to a decision before presenting a policy to his subordinates. There is nothing more damaging than letting your subordinates know you disagree with a policy but that it has to be followed anyway.

4.2.1.3 Signals to Subcontractors and Buyers

Positive signals to those outside the organization are also critical for a safe job-site and for assuring future work. The job-site manager has the greatest ability to influence subcontractors and buyers.

Most clauses on safe practices and procedures included in contracts with subcontractors are often seen as protection for the general contractor against lawsuits from a third party should the subcontractor's unsafe acts cause damage or injury. The smart manager is one who sees through this and realizes that he must play an active role in assuring that subcontractors perform safely. General contractors are responsible for the entire job.

Therefore, poor safety performance by subcontractors will reflect negatively on the general contractor.

Managers should discuss safety considerations in all meetings with their subcontractors and make sure that they understand that safety is the number one priority on the project. Subcontractor foreman should be required to attend project-wide safety meetings to enhance cooperation and understanding. Subcontractor safety performance should be monitored so that results can be analyzed to determine if this subcontractor will be invited to bid on future projects.

The smart construction buyer is one who demands contractors with outstanding safety records since they have proven to be the most cost effective. Conscientious buyers monitor contractor performance throughout the life of a project to ensure the contractor is performing as expected.

The job-site manager is a key player in making buyers aware of the contractors commitment to safety. They include safety questions and problems in progress meetings with buyers. They encourage buyer representatives to participate in job-site safety inspections and safety meetings. They encourage buyer safety audits and suggestions for improving project safety. The willingness to volunteer information on the part of the contractor gives the buyer that "warm, fuzzy feeling". When it comes time to bid another job, he'll remember those who are easiest to work with.

4.2.2 People Building

It is easy to see why many construction companies take little interest in investing time and training in long range development of their craftspeople. Most construction workers move from job to job with different companies since most companies do not have permanent positions for their non-supervisory personnel. However, research has proven that managers that value long range development of their personnel have better safety records.

Hinze found that superintendents who were rated by their bosses as above average or excellent in their working relationships had significantly lower accident rates. Hinze further analyzed the problem by asking managers what was the major problem they had on the job. He classified the responses into two categories: physical problems such as bad weather, lack of material and late deliveries and problems dealing with field personnel. He found that superintendents who reported that people were their major problems had significantly more injuries than those who stated other types of problems were their primary concern (11-101). From this data it is reasonable to assume that managers who are less adept at working with people had more personnel problems and created conditions which led to more accidents among their people.

4.2.2.1 Approach to Firing

The proper disposition of an inept or ineffective worker is a key factor in maintaining productivity, safety, and employee continuity. Firing and the threat of firing are often considered to be effective tools used in solving employee problems. However, studies show that firing is used only as a last resort by managers with the best safety records.

Successful managers allow foreman to hire and assign crews on their own, but do not give foremen the authority to fire workers they hire. This results in maximizing crew compatibility and prevents foremen from establishing "little empires" within the project where "their word is law and there is no recourse for the worker" (11-101). Increasing crew compatibility and decreasing worker isolation both improve safety performance.

The reluctance to fire does not cause higher accident rates. Hinze studied managers in a hypothetical situation where they are faced with a good worker who has been advanced to a foreman position on a complicated job only to find that the foreman cannot handle the job. When asked what they would do, the managers with a much lower average injury frequency rate said they would work with or transfer the foreman rather than lay off or demote him.

Managers should also realize that workers who are removed from a job which they perceived to be a good job to a job which they considered to be poorer or less prestigious had higher incidents of accidents. Also, "among skilled workers where the

worker was exercising his trade, one worker in twenty became an accident victim, while if a skilled worker were not exercising his trade, one worker in six or seven was a victim" (3-125).

4.2.2.2 Handling Conflicts

Although following the chain-of-command is important when dealing with problems, the manager must allow flexibility to ensure all sides of the story are heard. Hinze found that managers who automatically supported the foreman's position when faced with a worker complaint had poorer safety records than those who worked to resolve the conflict by listening to both sides. If the two sides could not resolve their differences then the worker could be transferred to another crew. This should only happen in rare instances. Unless there is just a plain personality conflict between the two individuals, one party is in the wrong. If the manager does not handle these situations properly, they will be faced with numerous complaints from employees with bad attitudes.

Getting the job-site manager involved in conflicts results in a win-win situation. This approach combined with restrained approach to firing helps reduce tension on the job. All workers know that they will make mistakes and they try to predict how their boss will react to these mistakes. Will the worker be treated harshly, perhaps be fired, or will he be allowed to learn from his mistakes and continue to contribute to the project? The firing of a single worker on a job-site can spread fear of harsh

treatment and increase tensions. This, in turn, will increase the likelihood of accidents. The skilled manager can prevent this scenario from happening.

4.2.2.3 Rewarding for Good Work

Samelson found that safer crews were more likely to state that their managers praised them for doing a good job (11-102). However, they added that indiscriminate praise not based on fact was counterproductive. This easy to understand. Positive reinforcement fosters feelings of pride and decreases the pressure felt on the job. Indiscriminate praise causes the worker to feel he is being patronized. Well-deserved praise is an effective and inexpensive way to build pride and self-confidence on the job.

4.2.2.4 Using Competition and Pressure

Competition and pressure are two popular techniques used by foremen to improve productivity. For instance, a foreman who has two crews doing similar jobs may encourage them to compete knowing that the competitive instinct we all have will stimulate the men to work harder, thus improving productivity. It is not surprising that Hinze found that safer managers did not rely on competition and pressure to increase productivity. (8-103). Competition used primarily as a motivating tool encourages people to take unsafe shortcuts and increases emotional tensions.

Hinze also found that job-site managers who used cost information to put pressure on workers had a higher average injury frequency than those who did not use cost information in this manner. In fact, using cost information to put pressure on workers is counterproductive not only to safety but also to cost! Hinze found that job-site managers rated excellent by their superiors on their ability to meet costs had significantly fewer injuries on their jobs than those rated lower (9-64).

4.2.2.5 Maintaining Employment Continuity

It is obviously difficult for a construction company to have the same work force on job after job. However, the smart manager will make a concerted effort to maintain as much employment continuity as possible. Hinge found that " those who rehire 50 percent or more of their workers have far fewer accidents on their jobs than those who rehire fewer than 50 percent" (11-103).

Maintaining employment continuity improves job safety in many ways. Many workers on the project have been trained through the company and already know its priorities and approaches to problems. These workers are the nucleus that can be used to help train the new workers. Many of the experienced workers have formed working relationships with each other, thus increasing their ability to cooperate.

Managers who are effective at handling their people will have no problem maintaining employment continuity. Even when

work is plentiful in construction, workers will gravitate toward those who treat them right.

4.3 The Foreman

The foreman-worker relationship is where the rubber meets the road with respect to safety performance. The foreman is the one who presents safety to the workers on an hour-by-hour, day-by-day basis. All the training and direction from upper and middle management means nothing if the foreman does not do his job to ensure safe work.

Safe, productive foremen believe safety management at the crew level is practical and achievable. This section reviews the steps these foreman take that result in safe and productive work.

4.3.1 Working with Crews

Foremen are the people who drive the project. They are the decision makers and the leaders of their crews. They must have the technical skills to know the difference between poor and quality construction as well as the paperwork skills to keep management and other outside forces at a distance. While these skills are important, what usually separates an average foreman from a good foreman is the level of leadership and people handling skills. Knowing the proper way to handle various situations can result in a safer workplace.

4.3.1.1 Handling Low Crew Productivity

As demonstrated in the previous section, applying pressure to workers to improve productivity is not cost effective, as well as being unsafe. However, this is often the solution chosen by many. Instead of this knee-jerk reaction, the effective foreman will take the time to analyze the problem to determine its root cause.

The foreman should step back and consider what he can do to help the crew do its job. He should find out what they need in the way of materials or equipment to help them complete the work more quickly and/or safely. Obviously, the smart manager planned ahead by asking these questions before the job got started, but glitches can often develop. Involving the crew in the solution builds pride and confidence. Blindly responding to low productivity with pressure breeds tension and negativism.

4.3.1.2 Handling Crises

The typical construction job holds enough surprises to drive even the calmest foreman nuts. Days containing multiple crises are not uncommon and are likely to test the foreman's patience. The safe, productive foreman is one who keeps his cool and does not vent his frustration at his crews.

Should the actions of his crew cause him to become upset, he should take a step back and cool off before talking to the crew. Foremen who lose their tempers and vent their anger at a worker can turn the worker against them and against the goals they are

both working toward. Anger creates tension that may cause a worker to forget the hazards of the job and become careless.

There are definitely situations were a crew or individual worker requires a stern "talking to" in order to correct a problem. The foreman's choice of tone of voice, location, and people present all play an important part in determining the effectiveness of the message. A good rule of thumb is "praise in public, criticize in private". Embarrassing a worker can damage his morale and breeds contempt towards the supervisor.

4.3.1.3 Responding to Good Work

Just as in the case of the job-site manager, the foreman's best way to respond to good work is to complement the crew by thanking them for a job well done. Foreman who only swear at their crews when they screw up cannot match the safety record of those who take the time to show appreciation for their crews with a few words of praise.

4.3.1.4 Correcting Unsafe Acts

The successful foreman must continually monitor his job-site for unsafe conditions and unsafe acts. From day one, the foreman must ensure his workers understand that unsafe behavior and taking chances are unacceptable. Quickly locating and stopping unsafe acts is critical. If one worker is permitted to get away with an unsafe practice, others soon follow. Before you know it the whole crew is working unsafely.

Another factor the foreman must pay close attention to is consistency of enforcement. For instance, the steelworker crew may be wearing safety goggles but a carpenter crew doing similar work that endangers the eyes is not wearing the goggles. Workers will quickly pick up on this discrepancy and question the foreman's knowledge of safety and lose their respect for him. In the same manner, material suppliers and other outsiders who visit the job-site must adhere to all safety policies. Even VIPs, as a minimum, should have hard hats and steel-toed shoes on if construction is in progress.

Crew members should be encouraged to look for unsafe acts and take immediate action to correct them. Safety is not the sole responsibility of the foreman or the safety supervisor. " Very safe crews watch out for each other and stop each other when they see one of their members doing something unsafe" (11-119). Foreman who must continually bring safety problems to the crew's attention have not effectively brought home the fact that safety is everyone's responsibility.

4.3.1.5 Keeping Attention Focused on the Job

As seen in chapter three, there are many factors which can take a worker's focus off the job at hand. Many are related to personal problems at home over which the foreman can effect little influence. Anger, fear and other " emotions turn the worker's attention inward; thus the worker does not stay alert to the dangers which are ever-present on the construction site"

(11-120). These emotions cause conditions which reduce a worker's attention to his work thus increasing the potential for accidents.

There are some effective techniques for handling the worker with outside personal problems. The foreman's only connection with personal problems of their crew members is to give them time off when they need it. "The foremen who had the better crew safety records were not father confessors, or informal psychologists to their crew members" (14-31). Talking about home life fears and worries is more likely to activate these fears and worries in the work situation. If the problem is serious enough. the foreman can assist the worker in getting help, possibly through company channels. Also, for some temporary conditions, the worker may need a rest period or a temporary job reassignment.

The foreman can also assign a "big brother" to the worker to watch him closely during the course of work. For instance, many young Seabees were under heavy stress from problems at home and on the front while performing construction in Saudi Arabia during Operation's Desert Shield and Desert Storm. To prevent those particularly unstable from becoming hazards to themselves and to others, the leadership in my construction company ensured each was assigned a sharp senior man to look out for him. This man could then communicate the individuals status up the chain-of-

-command when necessary. This idea helped relieve pressure on the project managers, helped the individual worker, and resulted in a safer work environment.

4.3.1.6 Maintaining Crew Friendliness

Should friends be allowed to work together or not? Will friends spend too much time socializing resulting in lower productivity and safety? Research shows that crews comprised of buddies are more productive and safer (11-122). Friends are more likely to look out for each other and are therefore quicker to tell each other when safety regulations are being violated. Where good relations existed with co-workers, the accident rate was half that of situations where relations were bad (3-125). Certainly workers *do not* have to be buddies to get along on the job-site, but it definitely helps.

CHAPTER V
THE SAFETY PROGRAM

5.1 Introduction

The safety program encompasses all those procedures and policies necessary to ensure safe construction. A strong training program, proper planning, standardized procedures for daily operations, and a plan for evaluating safety performance must be in place if a company is to attain its goal of safe construction. This chapter analyses these elements in detail by demonstrating what safe companies include in their safety programs.

5.2 Training

There is no substitute for a knowledgeable, well trained worker on the job site. A company which places a high value on training will be paid dividends through higher quality work, reduced accident rates and higher profits. This section details the policies and methods best suited for an effective training program.

5.2.1 Formal Training

Formal training, or classroom training as it is sometimes called, is the cornerstone of an effective training program. A worker needs a basic understanding of the safe procedures required in construction work or he will present a hazard as soon

as he walks on the job-site. Even a basic understanding requires substantial time due to the complex nature of construction work.

The first step in establishing a formal training program is determining what the worker needs to know to in order to perform safely. Most organizations feel that the worker needs an overview of construction practices broken down into categories such as high work, handling and storage of equipment, fire prevention, etc.. The Naval Facilities Engineering Command and the Naval Construction Force utilize the United States Army Corps of Engineers Safety and Health Requirements Manual which breaks down safety procedures into thirty-five sections. The Associated General Contractors of America publishes a "Manual of Accident Prevention in Construction which breaks down safety procedures into forty-three sections. Both manuals would serve as the perfect textbook for an introductory safety course because they essentially take the overwhelming amount of OSHA regulations and boil them down to a concise manual designed so that the layman can easily understand. Similar manuals are also available through various organizations. It is recommended that a week long introductory safety course be given to all new employees. A condensed version can be taught on a yearly basis to veterans as a refresher course. For large, complex jobs that require a heavy work effort in a specific area, consideration should be given to holding special classes. For instance, a class on demolition safety for employees not experienced in this type of work is a much better idea than on-the-job training.

Instructors must remember that they are dealing with construction workers, not college students, when structuring their lesson plan. Most construction workers would rather be getting their hands dirty than be sitting in a classroom listening to an instructor. It is therefore important that the lessons are interesting and informative so that the student retains what he has learned. The following are a few ideas for keeping student interest and attention high:

1. Encourage student interaction. Have students relate their own experiences with respect to a given situation. Break the class into small groups and then present each group with a problem to solve and present to the class. This encourages the more reserved to get involved.
2. Use visual aids effectively. There is no shortage of safety films. Although it may seem that most were made before 1955, there is a good selection of more current films. Films should be carefully selected and integrated into the course. Students will gain little from watching countless hours of Joe Construction Worker cutting his fingers off. Another suggestion is to exhibit safety equipment in class. Let the student get the look and feel for the equipment before he starts work, thus relieving his fears.
3. Utilize job site visits. This is a method of getting the benefit of on-the-job training before the job

starts. Take a day to visit three or four sites and analyze what is being done right and what is being done wrong. The worker will see it again the first day on the job and he will already have experience.

4. Use a highly motivated, energetic instructor. You can get by with bare bones elsewhere if necessary, but don't scrimp here. College students may be able to learn despite a lethargic and ineffective instructor, but not so construction workers. An instructor who can keep a class of construction workers interested and learning is a valuable commodity.

5.2.3 New Worker Orientation

Failure to start a new worker out right can lead to disaster since new workers have a higher probability of having an injury than their more experienced co-workers. For instance, one study revealed that in the mining industry 48% of all industrial accidents occurred during the first two months of employment and 20% in the first week. A large steel mill had 74% of their injuries occur within the first year of employment and 46% in the first 30 days (9-7). There are numerous other studies that draw the same conclusion. The reason for this high accident rate is because new workers have not had time to become familiar with their jobs and are therefore nervous and are more likely to do the wrong thing at the wrong time. This accident susceptibility also accounts for the higher accident frequencies experienced

during the summer months when many industries are augmented by additional temporary workers (9-8).

The safest foreman realize that every new crew member should be treated as a new worker regardless of the individual's past experience or the amount of time planned for him to spend on the crew. Although the new crew member may have construction experience, this is his first time on a new job-site with which he is not familiar. This lack of familiarity makes him susceptible to injury on a site filled with hazards.

Although schedule pressures might tempt the foreman to put the new crew member to work immediately, he must realize that taking this approach will lead to delays, mistakes and accidents. The safer and more productive foreman save money by taking the time to train the worker and starting him off slowly. Following are the steps a foreman should take to properly train and orient the new crew member (11-110):

1. Ask the worker about his last job. This will help the foreman become familiar with the worker by finding out what his experience entails. The foreman can then make an initial job assignment and determine if any supplementary on-the-job training is required.
2. Describe the new job and rules of the workplace. A worker must have a clear understanding of what is expected of him if he is to live up to his superior's expectations. The foreman should stress that safety is the number one priority.

3. Give the worker a training session and test runs on all equipment and/or tools. Equipment and tools are too expensive to be trusted in the hands of an inexperienced person, as well as representing a serious safety problem. Do not assume a worker has experience. Take the time to find out. Perhaps he has operated a piece of equipment for years. A test run may reveal he has operated it unsafely all of this time.
4. Show the worker around the site. This gives the foreman a chance to point out major job hazards before the worker starts working.
5. Start the new worker out slowly. Most new workers are anxious to impress their boss by pushing hard and hustling. This can add to the danger of an already hazardous environment. The foreman should take care to ensure that the new worker starts out slowly until he becomes familiar with his work and his surroundings.
6. Watch out for the new worker for the first few days. The foreman needs to ensure that his rules and priorities are effectively communicated to the new worker in the early stages. This also gives the new worker the means to ask questions and makes him realize there is a genuine concern for his well being.
7. Involve the crew in watching out for the new worker. Crews with safer records make it a habit to watch out for new workers (11-113). Crew members should take the time

to explain safe procedures and point out specific hazards on the job site. Looking over the new worker's shoulder helps prevent him from getting him into trouble he cannot get himself out of.

Safe foreman, in addition to orienting new crew members, also take the time to orient new crews before they begin work. The foreman should bring the crew together as a group and explain to them his priorities and what he expects from the crew. He should make it clear that safe, productive work is the only work that he will accept. Workers should know that unsafe acts will not be tolerated and that unsafe workers will be removed from the crew.

5.2.3 Toolbox Meetings

Meetings held by the foreman with his crew to discuss the current work and required safety precautions are commonly referred to as toolbox meetings. They are the most effective method of on-the-job safety training available if conducted correctly. Toolbox meetings are held on a daily or weekly basis. It is suggested that ten minute meetings be held daily to best keep the worker informed. Daily meetings consume more time, but the dividends paid in increased worker awareness are worth the time.

The key to successful toolbox meetings is focusing on the work to be accomplished that day. Hinze's research showed that superintendents who indicated that toolbox meetings were primarily used to discuss generalities had poorer safety records

than those who mentioned job specifics in describing topics of their toolbox meeting discussions (11-97).

Foreman are usually tasked with conducting toolbox meetings. Because meetings are held daily and the phases of the work move so quickly, it is important that the foreman does advanced planning so that he can deliver an effective message to his men.

The foreman should pick a topic that is relevant to the day's work. He should start the meeting by relating an incident from his own experience and/or using a visual aid from the job-site. The workers should be asked to voice their own opinion on how to solve the problem or reduce the risk. Ideas brought up by the men should be used if they are practical. If the idea cannot be used, care should be taken not to offend the volunteer by noting his contribution while explaining why the idea cannot be used (1-12). Accidents and near accidents that occurred the previous day should be discussed.

There are many tools available to the foreman to assist him in preparing topics for toolbox meetings. Appendix D shows a pocket card for foremen in underground construction. One side of the card lists various topics for discussion while the other side explains how the foremen should conduct the meeting. Appendix E shows a sample toolbox topic card with text and questions provided by the Liberty Mutual Insurance Company for its clients. A company can choose to utilize these or other tools to assist their foreman. There is no need for the foreman to come up with ideas from scratch.

5.2.4 Foreman Training

Foreman make hourly decisions that effect safety. It is therefore imperative that they are highly knowledgeable on safe practices and effective management methods. However, many companies are reluctant to spend time and money training their foremen despite the fact that the potential rewards are enormous. "Levitt found that companies which had special orientation programs for newly hired or promoted foremen had experience modification rates 29 percent lower on average than companies which did not" (11-125).

Some large companies develop their own courses for foreman. Others pool their resources to support mutually beneficial training such as the jointly sponsored Laborer's-AGC Line Foreman Safety Training Course. Whatever option is chosen, the company should ensure the course accomplishes the following:

1. Teaches them how to observe people for unsafe acts.
2. Convinces them that safety should be equal to production, morale, quality and cost in their work.
3. Make them feel responsible for eliminating unsafe acts and hazards from their workplace.
4. Convince them to make a commitment to safety in their job.
5. Teach them how to recognize hazards on the job-site.
6. Teach them the people management skills necessary for safe work discussed in section 4.3.

7. Teach them how to recognize and handle workers with drug or alcohol problems.

Many foreman training programs focus primarily on teaching the foreman how to spot safety violations. There is no connection between the ability to correctly identify safety violations and crew safety record (11-128). As has been shown, effective safety management has a broad scope. Knowing the safety regulations is only a single part of the formula.

5.3 Planning for Safe Construction

Proper planning is usually the key to success in any venture. Safe construction is no exception. Proper planning initiated even before a construction contract is awarded will enable the contractor to complete the job in a safe, cost-effective manner with a minimum of last minute crises to deal with. Failure to plan safety into a job means it will not be there when the job starts.

5.3.1 Bid Stage Planning

Identifying safety requirements during the estimating process is the first stage in effective safety planning. As a minimum, most projects will require the following items:

1. First aid kits
2. Literature, warning signs, forms, etc.
3. Hazard-detection equipment, safety equipment
4. Fire extinguishers

5. Safety training

6. Videos and other material for indoctrination

7. First aid and CPR training

The smart organization has these items identified with their cost so that they can easily be incorporated into the project estimate. Now the job must be analyzed to determine any further safety requirements.

The estimator must consider the following items as a minimum;

1. Is any special equipment, such as manlifts or safety harnesses, required to complete the job safely? Will any extra training be needed to learn how to use this equipment?
2. Do any construction methods present an unusual safety hazard and what are the alternatives and their costs? For example, sandblasting lead based paint will create a health hazard. What about removing it using waterblasting?
3. Is the job large and/or complex enough to the degree that adding extra safety personnel would be cost-effective?

Should the job be awarded, the estimator's notes should be passed along to the site staff so that they do not miss any critical items. As has been proven, contractors who are careful to include all safety costs in their bid are more likely to have

the contract awarded to them since their insurance costs are significantly lower than their less safety conscious competitors.

5.3.2 Preconstruction Planning

Once the job is awarded, the job-site manager has much work to accomplish before construction can begin. Manpower, materials and subcontractors must be lined up, submittals must be prepared, and schedules revised. Safety, however, must remain a high priority.

5.3.2.1 The Safety Plan

The safety plan is a written document, often required by most governmental and many private owners, that includes the identification of "all potential hazards and hazardous operations and deciding on locations for storage of hazardous materials and for on-site medical, nursing and first-aid as well as provisions against fire and evacuation" (11-83). Although some of this document may be boiler plate, the safety plan must be job specific. The smart owner will carefully review the safety plan to ensure it is complete and properly addresses all hazards. As was noted in chapter two, an owner can be held liable for accidents resulting from defective safety plans.

The safety plan should be as detailed as possible. For instance, a safety plan for roofing work should not state "an approved system for fall protection will be installed". The correct approach would be to sketch the restraint system used

noting the strength and type of materials used. This assures the owner that a safe system will be used and enables the contractor to order the correct material. This detailed approach also helps eliminate delays since any disputes can be solved before erection of the safety system begins.

Site planning should also be included in the safety plan. Equipment can be selected and positioned for the most effective and safe use. Materials storage and handling can be organized to reduce traffic flow and improve closeness to the point of usage. Emergency access routes and procedures can be developed and incorporated into the plan.

The safety plan is not a static document. As the job progresses it can be modified to better fit the conditions experienced on the job. All foremen and key project personnel should be thoroughly familiar with the plan and be expected to follow it.

5.3.2.2 Planning with Subcontractors

Construction contractors have moved toward hiring subcontractors to execute a larger percentage of work on their jobs in recent years. It is therefore critical, since primes often suffer economically as a result of poor subcontractor performance, that the subcontractor is included in preconstruction safety planning.

The smart contractor will only hire a subcontractor with whom he has worked before or who is known for his excellent

safety record. The subcontractor must be required to submit a safety plan equal in quality to the prime contractors plan since the prime will have to incorporate this as a part of its plan. A safety clause, similar to the clause in the prime contractor-owner construction contract should be a part of the prime-subcontractor contract. This will serve to hold harmless the prime as a result of negligence of the subcontractor. A clause detailing any special safety precautions should be included if necessary to prevent the subcontractor from claiming for unanticipated costs.

Just as in the case of the foreman and his crew, the job-site manager must make it clear in no uncertain terms that safety is the number one priority and that unsafe practices will not be tolerated. The subcontractor may have developed unsafe habits while working for less safety conscious primes. Knowing up front what is expected will prevent conflicts down the line.

5.3.2.3 Planning During Construction

To ensure success, planning cannot stop once the work starts. Job-site managers should utilize weekly and monthly planning to look ahead and avoid surprises. Changes and unexpected conditions are routine occurrences on a job-site. Every change in site conditions, site operations and new construction represents a potential hazard. Toolbox meetings. site inspections and open lines of communication are excellent tools that can be used to successfully adapt to these changes.

Planning for safe construction has proven to be profitable. Levitt concluded that those contractors encouraged detailed work planning had the best safety records. Companies that discussed safety in weekly schedule and progress meetings had much lower accident costs than those who did not normally discuss safety in such meetings (11-85). Hinze found that daily planning meetings are more effective than weekly meetings. Taking the time and effort to plan must not be overlooked.

5.4 Daily Operations

High quality training and proper planning lay the foundation for safe construction. However, it is up to management and the work force to properly execute on a daily basis for safe construction to become a reality. This section details the methods and tools used by companies that execute safely.

5.4.1 Safety Rules on the Job

Safety rules and regulations must play an important role in job procedures. Many large companies utilize procedure manuals to assist the crew during construction. Including safety procedures in these manuals would be ideal. If not, a separate manual for safe working procedures should be adopted. Having something down in black and white makes it more difficult to stray from safe construction.

As previously indicated, toolbox meetings are an excellent way to communicate safety rules and procedures. Special care

must be taken prior to starting a new phase of construction to ensure workers know what is expected of them. Workers are more likely to experience accidents during the start of a new construction method or process.

Although many foreman can easily point out an unsafe condition, many fail to realize that proper housekeeping is an absolute fundamental of job-site safety. All workers must be required to clean-up as they go to prevent the site from being clogged with falling and tripping hazards. For larger jobs, it would pay off to assign a single worker to maintain job-site cleanliness. In addition to reducing safety hazards, maintaining a clean, organized site prevents wasted man-hours for last minute clean-up for the numerous VIP visits many jobs experience.

5.4.2 Safety Inspections

Because an unsafe condition can appear and disappear so quickly, it is important that the organization have a formal and informal safety inspection policy in place. Even the strongest of safety programs can not make a job 100% safe.

By an informal safety inspection policy, I mean that all company personnel, while visiting or inspecting the job-site, should be on the lookout for unsafe conditions or acts. This is another way to stress that safety is everyone's responsibility, not just the foreman's or safety supervisor's. If the company chooses to use a safety supervisor for the job, he should make an informal inspection daily. Formal weekly inspections should be

held by the safety supervisor in addition to any combination of the foremen, job-site manager, safety committee members, and the company safety professional. Results must be recorded and forwarded up the chain-of-command. Monthly inspections can be held with a different combination of personnel is desired.

Obviously, the make-up of the inspection team will vary depending on the size of the project and the personnel available. The bottom line is that inspections are held on a consistent basis and that deficiencies are acted on immediately. Trends should be analyzed to expose problem areas so that training emphasis can be shifted if necessary.

5.4.3 The Reporting System

Standardized forms are an excellent tool for recording and reporting safety performance. Good documentation helps substantiate disputed facts and encourages attention to detail and must be stressed to all personnel.

It is easy to quantify the safety program into specific actions and documents. The documents shown in Appendix F have proven to be the manageable minimum (6-16). Appendix G shows a suggested basic filing system that can be utilized by someone familiar with safety but inexperienced at establishing the necessary administration systems. The sample forms listed below and included in the appendices are just samples. Forms should be modified, deleted or added depending on the needs of the company. Sample forms include:

Form 1.1	Employee Safety Orientation	Appendix H
Form 1.2	Weekly Toolbox Meetings	Appendix I
Form 1.3	Supervisors Report of Accidents and Investigations	Appendix J
Form 1.4	Monthly Construction Inspection Checklist	Appendix K
Form 1.5	Fire Extinguisher Inspection Report	Appendix L
Form 1.6	Crane Operator's Daily Inspection Report	Appendix M
Form 1.7	Safety Deficiency Report	Appendix N
Form 1.8	Activity Hazard Analysis Form	Appendix O
Form 1.9	Activity Hazard Analysis Worksheet	Appendix P

5.4.4 Worker Participation

There are many methods available to encourage worker participation in the safety program. Enthusiastic participation helps contribute to a safe, clean job-site.

For example, competitions can be held to see who can maintain the cleanest job-site. Contests can be used to solicit safety slogans or to design safety programs. A mock game show can be held that tests worker's knowledge of safety rules and regulations. The possibilities are endless. All it takes is a little imagination to spur interest in safety.

Contests with nominal prizes are a simple affair, but many companies take a more serious approach by awarding incentive bonuses for safe work performance. This approach to improving

performance, however, is flawed because lost-time accidents to individual workers are rare events. "A typical construction worker would expect to have one OSHA reportable injury about every 7 to 10 years" (11-56). Therefore, a worker who was ten times as unsafe as the average worker would experience about one OSHA reportable injury per year. An incentive plan that rewarded the worker for each week without a reportable injury would still reward this very unsafe worker 51 weeks out of every 52! Is the answer to use a more frequent injury classification such as a first aid injury the answer? No. This would only encourage the worker not to report the accident.

5.5 Evaluating Safety Performance

Monitoring the success of the safety program and making necessary changes is the final ingredient required to ensure that the program is as effective as possible. The necessary checks and balances must be in place to guarantee that (5-91):

1. The safety program is working properly
2. All personnel within the program are performing as required.
3. The program is continually reviewed, modified, and proved to ensure that all safety concepts are applied to every project.

5.5.1 Review of Safety Inspections

Safety inspection reports are the prime indicator of the level of safety present on the job-site. As a minimum, reports should list all discrepancies and the time required to resolve them. Discrepancies that continue to occur may indicate a need for more training. Failure to correct deficiencies quickly requires that the foreman be reminded of his responsibilities.

Reports should mention any accidents that occurred since the previous inspection and the action taken to correct the deficiency. Noting the quantity and quality of personal protective equipment and other safety equipment is also a good idea.

5.5.2 Review of All Accidents

Assuring accident investigations are conducted properly and effectively using the information gathered is key factor in preventing repeat occurrences and strengthening the safety program. It is important to remember that near-misses are far more frequent than accidents and the smart organization treats them in the same manner by conducting an accident investigation.

The reviewer should ensure that the accident was properly investigated in a timely manner. Attention to detail is especially critical here since the documentation could be used in legal proceedings.

All accidents must be categorized and compared against company and national records to determine if the company's

performance is improving and how it compares to the competition. Determine causes and evaluate trends to determine if company policy requires adjustment or if additional training is required. Assistance in any of these areas is available from the company's insurance carrier and OSHA.

5.5.3 Miscellaneous Reviews

No portion of the safety program must be overlooked. The following are some areas where problems often occur and would warrant a closer look:

1. Review training in all areas to determine if sufficient training has been achieved. Look to improve the quality of the current training as well as supplement it if required.
2. Continually review all job-site rules and regulations. The job-site is in a constant state of change and safety rules need to keep pace.
3. Review company policies to ensure all parts of the organization are involved in providing for safe construction. For example, perhaps the purchasing department is buying the least expensive tools and equipment available. These tools and equipment also happen to be the least safe. Maybe the safety supervisor should review all orders with purchasing to ensure safe equipment is purchased.

CHAPTER VI
CONCLUSIONS AND RECOMMENDATIONS

Quality Management is currently the hottest topic in the construction industry because contractors and owners now realize that quality saves money. Although improved safety practices offer even more substantial savings, many in the industry have failed to take notice. The attitude that accidents are a cost of doing business is still deeply ingrained in the minds of many contractors. The facts clearly show that those who treat safety in the same manner as cost, schedule and quality are rewarded with success.

Attaining this success requires that the contractor's management and labor understands what separates the safe contractors from the unsafe contractors. A solid training program and a strong desire for safety at all levels of management lay the foundation. Once this is accomplished, monitoring and adjusting the safety management system will continue to produce better results.

All levels of management should undergo some behavioral training to sharpen their people skills. As has been shown, understanding why people react the way they do is key to preventing unsafe acts. A working knowledge of all construction safety regulations at all levels of the chain-of-command is also important. The foreman should not be the only one who can spot violations on the job. Even the new worker on his first day of work must be knowledgeable of the hazards the job presents.

The chief executive must be the catalyst to his staff by providing strong leadership in the safety arena. If the boss shows limited interest, the subordinates will show limited interest. The chief executive must hold safety as the number one priority and not tolerate anyone who does not follow this lead. Research has dispelled many myths regarding safety management. We have seen how things such as the proper approach to firing and maintaining crew friendliness effect safety performance. The smart construction company must take the steps necessary to ensure management understands and uses these concepts.

A strong training program is a must in many areas, safety is no exception. Construction companies must realize that training takes time and money, but the investment pays for itself many times over. Significant effort is needed to ensure that the training program is kept current and responds to any specialized work the company may be doing.

Safety conscious companies realize the value of advance planning. Safety concerns must be incorporated into the job beginning with the bid stage. A detailed safety plan ensures proper the proper methods and materials are available at the start of all phases of construction. The safe contractor must also ensure that all of the subcontractors are held to the same high safety standards.

High quality safety programs can always be improved. Proper evaluation of performance will locate any problems so that

solutions can be implemented. The smart contractor will take the time to step back and look for any problems.

There are many construction companies with outstanding safety records. Some are huge organizations, such as Bechtel, that have the financial resources to hire the best safety professionals to manage their safety programs. However, many medium-size and small construction companies are performing in a similar manner. You do not have to be a certified safety professional to understand and implement the concepts discussed here. Any construction manager can implement these concepts with a small investment of time and money. The organization he works for will be grateful and he will guarantee himself continued employment. Companies that do not place safety as a high priority have a limited life span.

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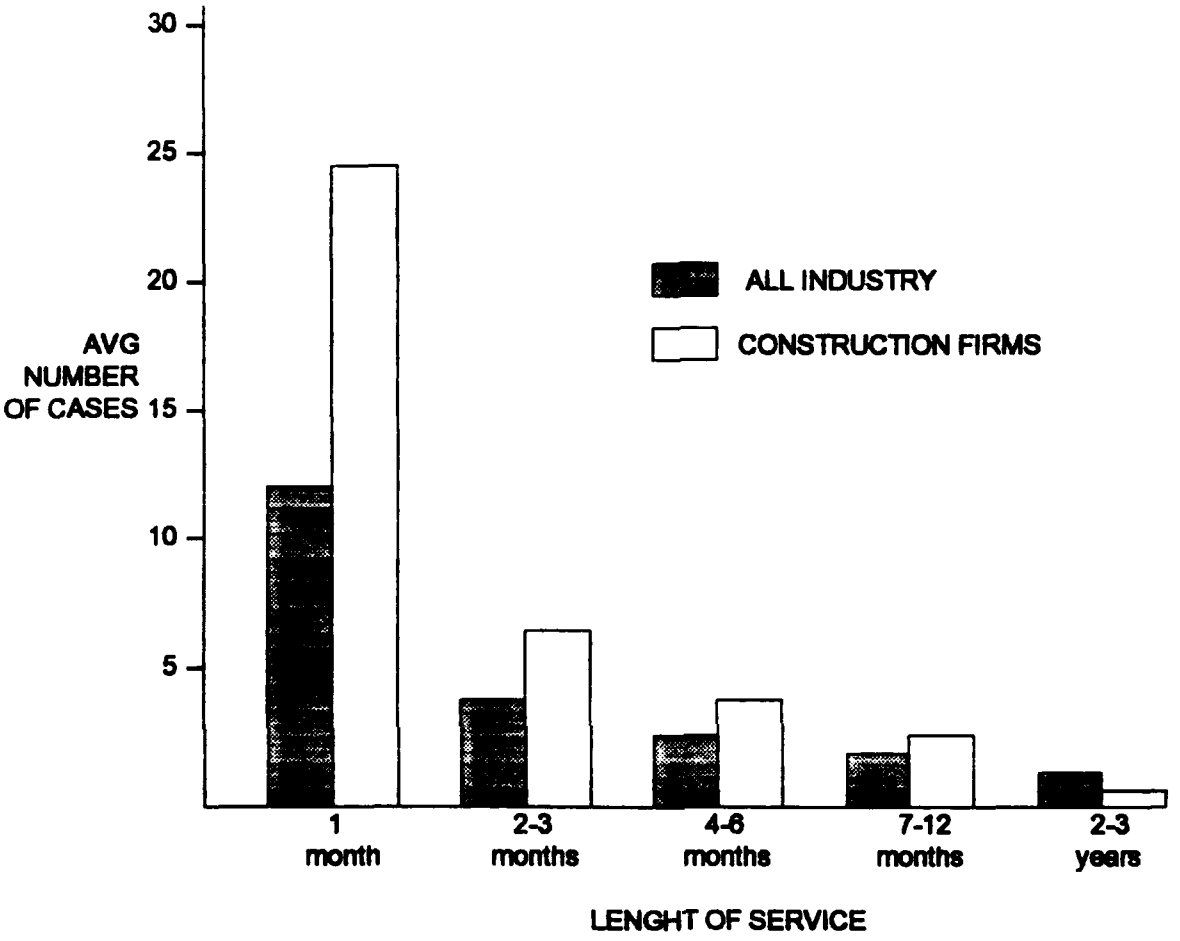
APPENDICES



APPENDIX A: Work Injuries and Illnesses by Length of Service
Source: (11-59)

Rank	Life Event	Value
1	Death of a spouse	100
2	Divorce	73
3	Marital separation	65
4	Jail term	63
5	Death of a close family member	63
6	Personal injury or illness	53
7	Marriage	50
8	Fired at work	47
9	Marital reconciliation	45
10	Retirement	45
11	Changes in family member's health	44
12	Pregnancy	40
13	Sex difficulties	39
14	Gain of new family member	39
15	Business readjustment	39
16	Change in financial state	38
17	Death of a close friend	37
18	Change to different line of work	36
19	Change in number of arguments with spouse	35
20	Mortgage over $xx,xxx	31
21	Forclosure of mortgage or loan	30
22	Change in work responsibilities	29
23	Son or daughter leaving home	29
24	Trouble with in-laws	29
25	Outstanding personal achievement	28
26	Wife begin or stop work	26
27	Begin or end school	26
28	Change in living conditions	25
29	Revision of personal habits	24
30	Trouble with boss	23
31	Change in work hours, conditions	20
32	Change in residence	20
33	Change in schools	20
34	Change in recreation	19
35	Change in church activities	19
36	Change in social activities	18
37	Mortgage or loan under $xx,xxx	17
38	Change in sleeping habits	16
39	Change in number of family get-togethers	15
40	Change in eating habits	15
41	Vacation	13
42	Christmas	12
43	Minor violations of the law	11

APPENDIX B: Table of Life Change Units
Source: (8-43)

ACCIDENT COST SCHEDULE (in 1979 dollars)

BODY PART	AMPUTATION	INJURY TYPE: STRAIN SPRAIN, CRUSH MASH, SMASH NLT	STRAIN SPRAIN, CRUSH MASH, SMASH LT	FRACTURE NLT	FRACTURE LT	CUT PUNCTURE LACERATION NLT	CUT PUNCTURE LACERATION LT	BURN NLT	BURN LT	BRUISE ABRASION NLT	BRUISE ABRASION LT	OTHER NLT	OTHER LT
HEAD, FACE	NA			700	8,000	250	3,000	325	7,500	250	1,000	350	6,000
EYE(S)	(1) 46,000					250	3,000	200	5,000	300	1,000	300	5,000
	(2) 246,000												
NECK AND SHOULDER	NA	350	7,000	1,600	8,000	250	3,000	325	5,000	250	2,000	300	7,000
ARM(S) AND ELBOW(S)	(1) 190,000	350	4,000	1,000	6,000	250	3,000	250	5,000	300	3,000	250	6,000
	(2) 250,000												
WRIST(S) AND HAND	(1) 62,000	275	2,500	700	9,000	250	3,000	325	5,000	250	4,000	350	8,000
	(2) 250,000												
THUMB(S) AND FINGER(S)	8,000 ea. up to 37,000	275	2,500	360	5,000	250	3,000	200	5,000	200	3,000	200	5,000
BACK	NA	2,000	10,000	NA	100,000	250	3,000	325	7,500	320	5,000	350	10,000
CHEST AND LOWER TRUNK	NA	450	4,000	NA	NA	250	8,000	325	5,000	250	3,000	250	9,000
RIBS	NA	350	1,000	450	4,000	NA	NA	325	5,000	350	3,000	300	9,000
HIP	NA	NA	3,500	450	12,000	200	3,000	325	5,000	360	5,000	450	4,000
LEG(S) AND KNEES	(1) 89,000	375	4,000	500	15,000	250	3,000	325	5,000	250	3,000	300	8,000
	(2) 280,000												
FOOT(FEET) AND ANKLE(S)	(1) 44,000	300	2,500	450	9,000	200	2,500	300	3,000	280	1,000	350	2,000
	(2) 90,000												
TOE(S)	7,000 ea. up to 40,000	300	1,500	250	2,500	250	3,000	325	2,000	200	1,000	220	2,000
HERNIA RUPTURE												200	8,000
HEART ATTACK													30,000
HEARING LOSS													10,000
DEATH													90,000

APPENDIX C: Accident Cost Schedule
Source: (11-20)

Suggested Tailgate Meeting Topics in Underground Construction

* Cave-in prevention and protection
* Positive ventilation in confined space
* Overhead high voltage lines
* Traffic control
* Pipelaying
* Trenching
* Earthmoving equipment
* Rolling pipe
* Water mains or utilities in trench or area
* Power tools
* Effects of equipment vibrations on trenches
* Personal protective equipment
* Poisonous plants
* Pacing work and lifting techniques
* Housekeeping

APPENDIX D: Pocket Card for Foremen in Underground Construction
Source: (11-69)

Suggestions for Tailgate Meetings in Underground Construction

Before the meeting

* Pick a single hazard which you feel is particularly relevant to the upcoming work.

* Consider ways to control this hazard. (Additional ideas might be found in Cal/OSHA guide)

At the meeting

* Tell your workers the hazard to be discussed at today's meeting and give an example from your own experience.

* Ask workers by name for their suggestions of what the hazards are and how they might be controlled.

* Summarize what has been said and add your input.

* Encourage your workers to ask questions.

* Keep meetings brief (5-10 minutes).

APPENDIX D: Pocket Card for Foremen in Underground Construction, (side two)

I'm sure you all know that falls cause more injuries in the construction industry than any other type of accident. In fact, about 40 percent of the serious injuries in the building trades are due to falls from one level to another.

Good protection of floor openings is one way of preventing these falls. This problem is a responsibility of management, but it is also the responsibility of the trades. If you have to remove guardrails or covers to work or hoist in a shaft, put the protection back when you are done.

In one recent accident, two laborers were cleaning up a floor area. They piled scrap lumber on a sheet of plywood and then picked up the sheet to carry the material away. Unfortunately, the plywood had been covering up a floor opening and the rear man walked into a 25-foot fall. When you cover a floor opening, secure the cover so that it won't be moved by accident.

If you remove a section of steel grating floor, rope off the area. these openings are particularly hard to see when the floor below is also a steel grating.

QUESTIONS FOR DISCUSSION

1. Do you know of any locations on this job where floor protection is either lacking or defective?

2. What procedure do the mechanical trades follow on this job for replacing or arranging for replacement of floor opening protection after they have removed it?

3. How do we draw attention to these hazard areas and make them highly visible?

4. Why is it necessary to clean regularly around these hazards and keep them clear of stored material?

APPENDIX E: Sample Toolbox Topic Safety Review Sheet (Floor Openings).
Source: (6-61)

FREQUENCY/ITEM	FORM USED AND COMMENTS	DISTRIBUTION
As Needed		
1. Employee safety indoctrination	Form 1.1	Copy to JF
2. Worker's compensation first report	Insurance company form of employers report of occupational injury or disease	Original to IC, copies to IAC, LP, CCD, JF
3. Accident investigation report	Form 1.3	Copies to CCD< JF, ECM
4. Accident register (for every accident regardless of severity)	Simple log book	Original at job-site. copy to CCD
5. Return-to-work slip	Self-explanatory	Original to IAC, copies to JF, LP
6. Near-accident report and evaluation	Self-explanatory	Copy to JF
7. Safety deficiency report	Form 1.7	Copy to JF, ESS
8. Crane yearly inspection and load test certificate	Supplied with crane by owner	Copy to JF
9. Equipment and vessel certification	Supplied by manufacturer	Copy to JF
10. Hazard chemical material safety data sheets	Supplied by manufacturer	Copy to JF
11. Advertising, identification, information	Supplied by corporate company and federal government	Copy to JF
12. Test and approval certification for all first aid and safety equipment	Supplied by manufacturer and medical advisor	Copy to JF
Daily		
1. Daily job-site inspection	Small notebook	To JF on completion
2. Crane inspection	Form 1.6	Copy to JF
Weekly		
1. Toolbox meeting	Form 1.2	Copy to JF
2. Site fire extinguisher inspection	Form 1.5	Copy to JF
3. Safety committee progress meetings including subs	Minutes of meeting	Copies to JF, AA, ECM, ESS
4. Weekly job-site inspection	Small notebook and report	To JF on completion
Monthly		
1. Crane inspection	Supplier provides required forms	Copy to JF
2. Job-site inspection	Form 1.4	Copies to ESS, CCD, JF, SM
3. Safety committee inspection and meeting	Minutes of meeting	Copies to ECM, JF
4. OSHA 200 Log	OSHA form	Copies to CCD, JF

Note: All originals go to the corporate loss-prevention and/or safety department unless stated otherwise. The abbreviations used in the distribution column are defined as follows: JF, job file; CCD, corporate construction department; ECM, each committee member; LP, loss-prevention department; AA, all attendees; ESS, each site supervisor; IAC, insurance administration corporation; IC, insurance carrier; and SM, site manager.

APPENDIX F: Safety Program Paperwork Requirement Schedule
Source: (6-17)

1. Orientation form with each employee's signature and one complete set of orientatin information

2. Accident reports

3. Accident register log

4. Accident investigation reports

5. Worker's compensation/accident report and associated correspondence

6. Return-to-work reports

7. OSHA 200 log reports

8. Near accident reports and investigations

9. Toolbox meeting reports and worker complaints and suggestions

10. Subcontractor safety agreements and orientations

11. Fire extinguisher inspections

12. Safety committee meeting minutes

13. Monthly site safetyand safety equipment inspections

14. First aid, inventory approval certifications, and orders

15. Industrial hygiene information and material safety data sheets

16. First aid, CPR, and safety course training and site personnel records

17. Equipment and vessel test certificates

18. Crane inspections, crane owner's certification

19. Company safety information

20. Fatalgrams and other important official distributable information

21. Equipment damage and insurance reports

22. Safety committee observation reports

23. Correspondence, segregated as required

APPENDIX G: Suggested Filing System
Source: (6-19)

Form 1.1 Employee Safety Orientation

I have received and read (or had read to me) the following items which are marked:

General construction safety requirements [ ]

Corporate statement of safety commitment [ ]

Craft safety practices (list each trade manual) [ ]

_____ _____

_____ _____

Project rules and regulations [ ]

Emergency evacuation procedures [ ]

Emergency treatment procedures [ ]

Fire control procedures [ ]

Job-site safety program [ ]

Others (list): [ ]

_____ _____

_____ _____

I agree to follow all the instructions and procedures contained in this orientation.

I (have [ ] have not [ ]) successfully completed a Red Cross first aid course.

I (have [ ] have not [ ]) successfully completed a CPR course.

I completed these courses on _____
Date

The Occupational Safety and Health Act of 1970 requires me as an employee to cooperate in complying with the act under direction of company representatives.

Signed _____
Employee

Safety officer or designee _____ Date _____

APPENDIX H: Employee Safety Orientation Form
Source: (6-20)

Form 1.2 **Weekly Toolbox Meetings**

Meeting Date: _____

Business Discussions

Subjects discussed: _____

_____

_____

_____

_____

Suggestions: _____

_____

_____

_____

_____

Actions to be taken: _____

_____

_____

_____

Injuries and/or accidents reviewed: _____

_____

_____

_____

Employees present: (list those present on reverse side)

Number in crew: ____ _____ Number attending: _____

Craft safety representative: _____

APPENDIX I: Weekly Toolbox Meetings Form
Source: (6-21)

Form 1.3 Supervisor's Report of Accidents and Investigations

It takes longer to report an accident than to prevent one.

Project: _____ Location: _____

Name of injured: _____ Age: ____ Length of service: _____ Occupation: _____

Date of accident: _____ Time: _____

Work location at time of accident: _____

Extent of injuries: _____

Describe accident (state what injured was doing and circumstances leading up to accident):

_____

_____

_____

_____

_____

Check one in each section:

Accident type:

[ ] Fall, at same level
[ ] Fall, at lower level
[ ] Struck by
[ ] Struck against
[ ] Handling material
[ ] Caught between
[ ] Operating equipment
[ ] _____
[ ] _____

Unsafe practice:

[ ] Unsafe equipment
[ ] Unsafe loading, piling
[ ] Unsafe position
[ ] Working on moving machinery
[ ] Using without authority
[ ] Using at unsafe speed
[ ] Not using protective equipment

Unsafe condition:

[ ] Not guarded
[ ] Defective
[ ] Poor housekeeping
[ ] Safety equipment not used or provided
[ ] Poor lighting

Investigation:

Investigation made at scene _____ Yes _____ No

Discussed with (injured)(witness) (other) _____ Yes _____ No

[ ] Lost time
[ ] Serious injury*
[ ] Doctor case
[ ] First aid
[ ] Near accident

* Serious injury: (a) any work restriction or a physician's prescription for light work as a result of work injury; (b) laceration requiring mechanical closure (sutures or slips); (c) fracture; (d) work-caused eye injury treated by physician; or (e) injury causing lost time.

Why in your opinion did unsafe practice occur (worker lacked skill, misunderstood, lacked instruction, etc.)?

_____

_____

_____

_____

Why in your opinion did unsafe condition exist (hidden defect, not recognized, no authority to correct, etc.)?

_____

_____

_____

_____

APPENDIX J: Supervisor's Report of Accidents and Investigations Source: (6-22)

Form 1.3 (Continued)

What action has been taken to prevent recurrence?

_____

_____

_____

If action not taken, why not?_____

Witness:

_____

Supervisor: Manager:

_____ _____

Date of this report: _____

The unsafe acts and conditions that cause accidents can be corrected only when they are *known*. It is the *supervisor's* responsibility to *find* them, *report* them, and *state* their *remedy*.

Use the reverse side for additional comments and sketches.

All questions must be answered and the report sent to the corporate office responsible within 48 hours.

All property, tools, or material damaged as a result of this accident should be reported on the *First Report of Loss* form.

APPENDIX J: Supervisor's Report of Accidents and Investigations (continued)

Form 1.4 Monthly Construction Inspection Checklist

Date: _____ Location: _____

Subject	Yes	No	Remarks
1. GENERAL (Conditions of Job Site)			
a. Posting OSHA and other job-site warning posters			
b. Records of safety meetings up to date			
c. Toolbox meeting minutes records up to date			
d. Availability of first aid equipment and supplies			
e. Job-site OSHA documentation up to date			
f. Emergency telephone numbers such as police department, fire department, doctor, hospital, and ambulance posted in the proper places			
g. General cleanliness of working areas			
h. Regular disposal of waste and trash in the proper manner			
j. Passageways and walkways free from obstruction			
k. Adequate lighting of all work areas			
l. Nails removed or bent over on all lumber and fixtures			

APPENDIX K: Monthly Construction Inspection Checklist
Source: (6-23)

Subject	Yes	No	Remarks
m. Proper chemical waste containers used for disposing of segregated waste in the appropriate manner			
n. Sanitary facilities adequate and clean; more than one unit for 20 persons			
o. Good supply of clean drinking water			
p. Sanitary drinking cups available			
q. Correct head protection used by all employees outside offices			
r. Eye protection readily available			
s. Face shields readily available			
t. Respirators and masks readily available			
2. ELECTRICAL INSTALLATION a. Adequate wiring, well insulated			
b. Fuses provided			
c. Ground fault circuit interrupters in place			
d. Electrical dangers posted			
e. Proper fire extinguishers provided			
f. Terminal boxes equipped with required covers			
3. HAZARDOUS CHEMICALS a. Fire hazards identified			
b. Proper types and number of extinguishers easily accessible			
c. All containers clearly, indelibly identified			
d. Storage practices compatible with safety regulations			
4. WELDING AND CUTTING a. Screens and shields used for personal protection			
b. Protective clothing available and used			
c. All equipment in safe operating condition			
d. Power cables undamaged and protected			
e. Fire extinguishers of proper type readily available			
f. Regular inspection for fire hazards			
g. Flammable materials well ventilated and well away from hazards			
h. Gas cylinders secured upright			
i. Gas lines in good condition and protected from hazards			
j. Cylinder caps used in the correct manner			

APPENDIX K: Monthly Construction Inspection Checklist (Continued)

Subject	Yes	No	Remarks
5. TOOLS (Hand Tools) a. Employee-owned tools checked on and off site and inspected			
b. Damaged tools repaired or replaced promptly			
c. Proper tool being used for the job			
d. Safe storage, adequate facility for carrying safely			
TOOLS (Power Tools) a. Proper grounding used for each set of tools			
b. Proper training carried out			
c. All mechanical safeguards in working order			
d. Right tool being used for the job			
e. Tools neatly stored when not in use			
f. Tools and cords in good condition			
g. Good housekeeping for tools and auxiliaries			
6. MACHINES AND EQUIPMENT a. Safety goggles or face shields used where required			
b. Tools used where recommended			
c. Proper training for machines and equipment carried out			
d. Compliance with all local laws and ordinances			
e. All operators qualified to operate respective machines			
f. Machines in good working order			
g. Machines and equipment protected from unauthorized use.			
7. GARAGES AND REPAIR SHOPS a. No fire hazards			
b. Fuels and lubricants dispensed cleanly and safely			
c. Good housekeeping throughout shop			
d. Lighting adequate for safe working			
e. Carbon monoxide dangers identified			
f. All fuels and lubricants stored in proper containers in a properly ventilated area			
8. FIRE PREVENTION a. Phone numbers of fire department adequately displayed			
b. Records of fire instructions, planning, and training given to employees			

APPENDIX K: Monthly Construction Inspection Checklist (Continued)

Subject	Yes	No	Remarks
c. Fire extinguishers checked and documented			
d. "No smoking" displayed where necessary			
e. Fire hydrant access to public thoroughfare open			
9. HEAVY EQUIPMENT a. All lights, brakes, warning signals operative			
b. Regular inspection and maintenance shown			
c. Dates of lubrication and repair of moving parts recorded			
d. Roadways well maintained, accessible, and clear of interferences			
e. When equipment is not in use, it is unable to be used by unauthorized personnel			
f. Wheels chocked when necessary			
10. MOTOR VEHICLES a. Local and state vehicle laws and regulations observed			
b. Qualified operators			
c. Regular inspection and maintenance shown			
d. All brakes, lights, and warning devices operative			
e. All glass in good condition			
f. Weight limits and load sizes controlled			
g. Personnel carried in a safe manner			
h. Fire extinguishers installed where required			
i. Reversing alarms provided			
11. SCAFFOLDING a. Scaffold tied in to the structure correctly and safely			
b. Scaffold walkways free of debris, snow, ice, and grease			
c. All workers adjacent to scaffold protected from any falling objects			
d. All connections checked for rigidity			
e. Guardrails, intermediate rails, and toeboards erected and sufficient			
f. Erected in accordance with the regulations and checked			
12. LADDERS a. Properly secured to prevent slipping or falling			
b. Ladders inspected regularly and in good condition			

APPENDIX K: Monthly Construction Inspection Checklist (Continued)

Form 1.4 (Continued)

Subject	Yes	No	Remarks
c. Handrails extend 36 inches above top of each landing			
d. Metal ladders not used around electrical hazards			
e. Ladders not painted			
f. Safety feet in use			
g. Stepladders fully open when in use			
h. Rungs or cleats not over 12 inches on center			
i. Job-built ladders constructed of sound materials and meet regulations			
13. BARRICADES a. Floor openings planked over or adequately barricaded			
b. Adequate lighting provided in all work areas			
c. Traffic controlled to all work areas			
14. MATERIAL HANDLING AND STORAGE a. Materials stored or stacked safely			
b. Fire protection available			
c. Stacks on firm footings not stacked too high			
d. Clear passageways around material			
e. Proper number of workers for the working conditions			
15. EXCAVATION AND SHORING a. Excavations barricaded properly			
b. Correct shoring used for soil and depth			
c. Adjacent structures properly shored			
d. Equipment at a safe distance from edge of excavation			
e. Proper ladders provided where needed			
16. STEEL ERECTION a. Hard hats, safety shoes, and gloves being used			
b. Taglines and safety belts being used			
c. Floor openings covered and barricaded adequately			
d. Ladders, stairs, or other safe access provided			
e. Hoisting apparatus checked regularly			
f. Safety nets or planked floors being used			
17. HOISTS, CRANES, AND DERRICKS a. Outriggers used when required			
b. Cables and sheaves inspected regularly			

APPENDIX K: Monthly Construction Inspection Checklist (Continued)

Subject	Yes	No	Remarks
c. Loading capacity at lifting radius below the limit for the unit			
d. Signalers used when necessary			
e. Equipment is firmly supported when lifting			
f. Signals understood by operator			
g. Power lines inactivated, removed, or at a safe distance from all lifting exercises			
h. All equipment properly lubricated and maintained			
i. Inspections and maintenance logs kept up to date			
18. CORPORATE ADMINISTRATION a. General policy statement by senior corporate management with regard to safety and hazard control posted on site			
b. Policy (1) incorporated in employee indoctrination and (2) posted in a conspicuous place			
c. Conspicuous official notice boards on site			
d. Written safety regulations exist (1) on site,(2) are incorporated in orientations,and (3) are explained to all employees			

Identify type and location of unsafe acts and/or practices observed:

Site manager: _____

Site safety coordinator: _____

APPENDIX K: Monthly Construction Inspection Checklist (Continued)

Form 1.5 Fire Extinguisher Inspection Report

Date: _____

Serial Number	Type	Size	Location and Condition	Date of Last Charge

APPENDIX L: Fire Extinguisher Inspection Report
Source: (6-29)

Form 1.6 Crane Operator's Daily Inspection Report

Make: _____ Model: _____

Daily Visual Checks — *Initial each item as checked*

Item To Be Checked — Date					
1. Broken or cracked glass					
2. Damaged or missing guards or gear or chain case covers					
3. Drive chains and sprockets for cracked or broken pieces					
4. Oil or coolant leaking below rotating bed or car body					
5. Roller path, house rollers, and hook rollers for chips or cracks					
6. Boom hoist, whip line and hoist wire rope; pendants; load blocks; and sheaves					
7. Fuel tank(s); fuel gauges; and hose and connections					
8. Limit devices; boom/mast stops; drum pawls					
9. Control valves; levers and linkage; and instrument panel(s)					
10. Fire extinguisher available and in working order					

Daily Preventive Maintenance Checklist — *Initial each item as checked*

Item To Be Checked	Procedure	Date					
Radiator coolant	Check level and add when necessary						
Hydraulic system(s) level	Check reservoir, and add oil when necessary						
Gear case lube	Check level, and add when necessary						
Engine oil							
Transmission and/or chain case or reservoir							
Rotating bed sump (if applicable)	Check level, and add oil when necessary						
Converter input and/or output housing(s)							
Air compressor							

Remarks:

Date: Item: Date corrected:

Initials

APPENDIX M: Crane Operator's Daily Inspection Report
Source: (6-30)

Form 1.7 Safety Deficiency Report

[ ] VIOLATION OF RULES
[ ] UNSAFE ACTION

Date: _____

[ ] UNSAFE CONDITION

Observed: _____

Where observed: _____

Action taken or recommended: _____

Observed by: _____

Project manager/superintendent review or action: _____

Project manager/superintendent: _____ Date: _____

Distribution: *Original:* Supervisor of area of employees concerned
Pink: Project manager/superintendent
Yellow: Safety supervisor and job file

APPENDIX N: Safety Deficiency Report
Source: (6-31)

Form 1.8 Activity Hazard Analysis Form

Activity definition:

Activity location:

Simultaneous activities involved at the same location:

Crafts involved:

Assessed hazards (see worksheet): *Possible protections:*

Relevant historical data and the unpredictable:

Practical protection recommendations:

APPENDIX O: Activity Hazard Analysis Form
Source: (6-31)

Form 1.9 Activity Hazard Analysis Worksheet

The purpose of this sheet is to examine the following questions and establish the answers to them after evaluating the basic conditions and activities.

By answering these questions and others that may germinate from them, this complete analysis can now be evaluated and condensed to insert on the activity hazard analysis sheet.

1. Look at the critical-path activities on the project schedule; look for simultaneous phases which indicate simultaneous activities.
2. Define those simultaneous activities: where, when, and how do they occur?
3. Review these simultaneous activities to discern all the existing and predictable hazards that may occur. Look for those hazards that are not readily apparent.
4. Enlist head office and/or corporate or safety personnel to help define previous similar work and preventive actions; historical records of activities and accident frequencies; and types and severities of accidents.
5. Specify all the possible protections available.
6. Analyze and evaluate all the protections and enumerate all the practical protections.
7. Arrange necessary discussions, make necessary adjustments to the program, and prepare for execution of the preventive measures.
8. File and distribute the data for future use.

APPENDIX P: Activity Hazard Analysis Worksheet
Source: (6-32)